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(54) Connection element for producing a welded and glued connection

(57) A connection element comprises an adhesive film 2 with an embedded metal grid 1 for producing a combined welded and glued connection, in which fusing of the adhesive substance takes place in the over-lapping region of two sheet metal portions (5, 6) in a resistance-welding process and seals off the seam location. The element is provided by a metal grid (1) coated by a fusion-adhesive substance (2) not insulating welding current, and is thermally connectible with the sheet metal portions (5, 6) by periodically controllable current intensity delivered by a welding electrode roller.

Fig. 3

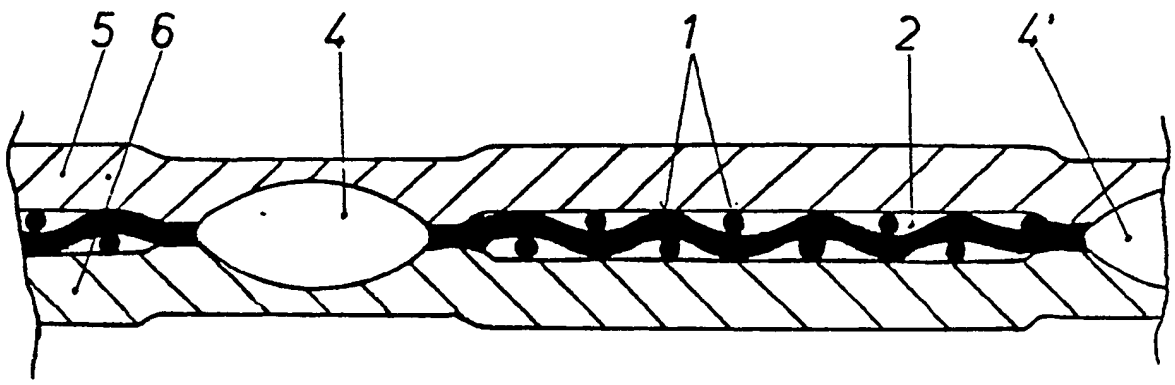

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Fig.1

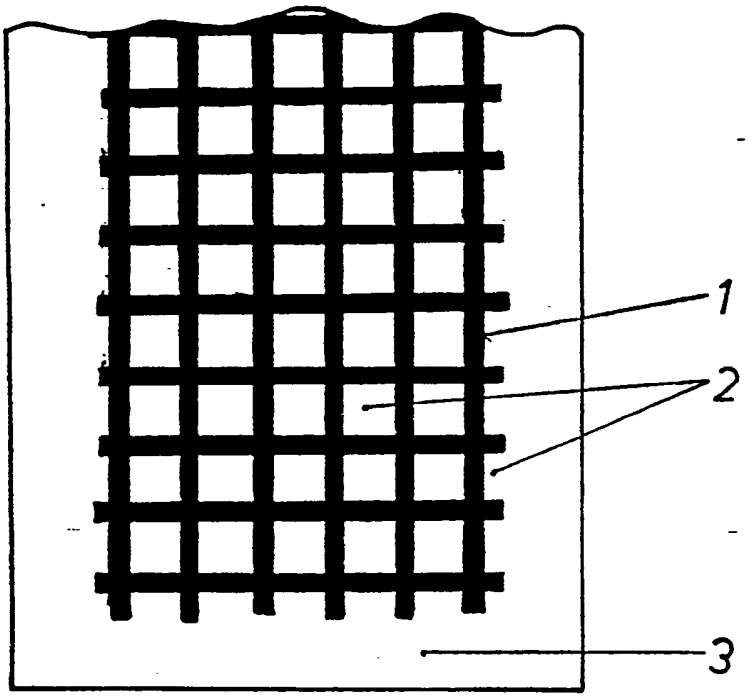


Fig. 2

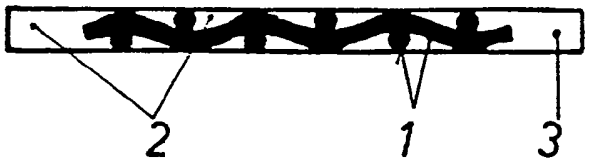
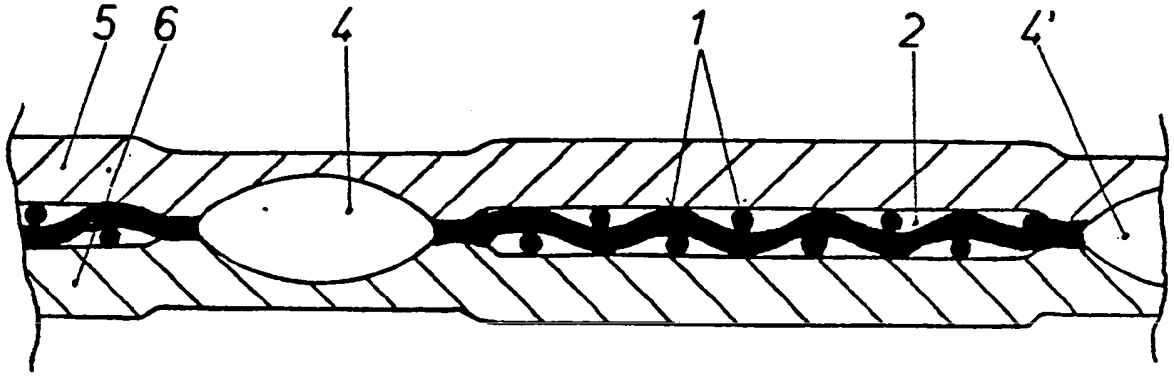


Fig. 3



CONNECTION ELEMENT FOR PRODUCING A WELDED AND GLUED CONNECTION

The present invention relates to a connection element for producing a combined welded and glued connection, by which a tight overlapping interconnection of sheet metal portions may be produced, for example, in one operating step with resistance-welding and glueing taking place simultaneously.

The production of metal connections in which adhesive substance is used as well as welding is known from different methods.

Thus, for example, spot-welding and glueing with the use of spot-welding adhesive substance ZIS 452 is described in DDR Trade Journal "Schweisstechnik", where reference is made to a welding-through method in which an adhesive substance of medium to high viscosity is applied to joint surfaces before the welding process and the adhesive substance is initially displaced out of the immediate welding region by the electrode pressure of the resistance-welding equipment after the parts to be connected have been placed together. Thereafter, a resistance-welding operation can be carried out normally with varied welding parameters. After the welding, the adhesive substance must be solidified. In this method, there are the disadvantages that the adhesive substance is pressed out of the seam gap due to the jointing pressure, does not harden completely outside the glued joint and must be removed for reasons of quality or for subsequent operating steps, such as colouring. This entails substantial manual effort and in some circumstances a health risk due to the chemical composition of the adhesive substance.

If use is made of a cold-hardening two-component adhesive sub-

stance, a longer period of use of the adhesive substance coating is presupposed, which, however, can be realised only with low-reactive adhesive substances. Otherwise, an acceptable hardening time, such as with hot-hardening single component adhesive substances, is achievable only by an additional heat treatment.

Moreover, a method for tight spot-welding connections by permanently elastic tapes is known and described in DDR Trade Journal "Schweisstechnik" 12/1975, in which an adhesive substance tape of permanently elastic chemical plastics M 1602, an elastomer on polyisobutylene base, is inserted between the connection surfaces and the welding operation takes place thereafter. In that case, there are the disadvantages that appreciable electrode pressures or "insert knuckles" are required in order to achieve displacement of the insulating adhesive substance layer in the welding region. That apart, this adhesive substance as adhesive substance tape has no influence on the strength behaviour of the joint connection.

There is therefore a need for a connection element in which the fusing of an adhesive may take place in the overlapping region of sheet metal portions with the application of normal electrode pressures of resistance-welding equipment, the resulting joint being so sealed that later operating steps can follow without finishing treatment, while a higher strength at the joint location may be achieved by the welding process in consequence of fusing of the metal grid with the sheet metal portions.

According to the present invention there is provided a connection element for welded and glued interconnection of two sheet metal portions at an overlapping connection region thereof, the element

comprising an electrically conductive sheet or strip which comprises a metal grid coated with a fusion-adhesive substance permitting transmission of electrical welding current to the grid and which is thermally connectible and sealable to the sheet metal portions at said region.

In the case of such an element there is no insulating effect to hinder resistance-welding and conventional metal welding can take place, with thermal destruction of the adhesive substance only in the immediate region of the welding point.

The electrically conductive strip maybe thermally connectible with the sheet metal portions by periodically controllable current intensity.

The strip preferably comprises a film of the fusion-adhesive substance in which a metal wire mesh is so embedded as a current-conductive material that the mesh is narrower than the film, so that a wire-free edge of the film projects at both sides and protects the wire, after fusion of the adhesive substance, against external influences such as air and humidity and thereby excludes corrosion of the wire. This fusion-adhesive film is then laid into the overlapping region of the sheet metal portions and a metallic connection is produced by a resistance-welding operation, preferably by spot-welding. In that case, the film is treated in the joint gap to be welding-through and/or melting by a periodically controllable current intensity. At the point of electrode action on the sheet metal portions, the welding process takes place at high current intensity and the fusion of the metal grid with the sheet metal portions takes place, during which the adhesive substance enclosing

the metal grid is combusted. The adhesive substance embedded around the welding location, thereagainst, is melted by the transmitted heat. In the case of large spacings between the individual weld points, the melting process an be initiated in the "cold" region and the glued connection can be produced by a thermal after-treatment. However, it is also possible to introduce the required welding-melting temperatures in differentiated manner along the strip. For example, with use of a rolled seam welding machine providing periodic welding current pulses, welding in the form of a stepped seam takes place at high welding current and in the intervals, with lower current flow, only a fusing of the adhesive substance takes place.

The use of the adhesive film with embedded metal grid is not restricted to a particular resistance-welding method. During processing of the film there are provided a glued connection tight against the passage of media and improved strength properties, in particular a higher dynamic strength in the region of the welding-glueing seam.

An embodiment of the present invention will now be more particularly described by way of example only with reference to the accompanying drawings, in which:

Fig. 1 is a plan view of a connection element embodying the invention;

Fig. 2 is a cross-section of the element of Fig. 1; and

Fig. 3 is a cross-section to an enlarged scale, of part of the element, connecting together two sheet metal portions.

Referring now to the drawings, there is shown a connection element comprising a metal grid 1 of a steel wire mesh, in the

form of customary sieve meshes, embedded in two adhesive substance layers, which have been liquified in a mould and pressed into strip or plate shape therein. The layers are thereafter cooled down and guided together under heat supply through renewed rolling or press die so as to produce an adhesive film 2 with embedded metal grid.

After this operation, the thickness of the adhesive film with embedded metal grip 1 is not visibly greater than the grid itself, i.e. there is only a thin coating of the adhesive substance on the grid, so as to be able to immediately permit an electrical contact during the welding operation. The size of the embedded sieve mesh can in that case be freely selected and adapted to the respective thickness of the part to be joined.

The embedded metal grid 1 is narrower than the film 2, so that complete enveloping of the grid is provided, whereby an insulation of the metal against external influences is produced after the melting of the adhesive substance and no detrimental effects, due to oxidisation, in respect of binding of the metals during welding and glueing occur in the adhesion of the adhesive substance to the metal.

Due to the wide, seamless outer adhesive substance edge 3, it is possible to cut the film 2 with embedded grid 1 to size matched to the width of the intended overlapping connection. The film 2 cut to size is then inserted into the overlapping region of the sheet metal portions to be connected. The film can cover the entire overlapping region. To facilitate the welding, the film 2 is fused to either or both joint surfaces by locally limited heating.

During subsequent spot-welding as shown in Fig. 3, a metallic connection between an upper metal plate 5, the grid 1 and a lower

metal plate 6 is produced at weld points 4 and 4', wherein the adhesive substance is thermally destroyed directly at the weld points 4 and 4', but melted in the surrounding area. Thus, an additional glued connection is produced between the plate 5 and the plate 6 with simultaneous sealing of the seam location. In the case of greater spacings of the welding points, melting of the adhesive substance between the welding points can additionally be carried out by thermal after-treatment. Due to the force-transmitting effect of the adhesive substance connection, the spacing of welding points in the resistance-spot-welding can be increased.

CLAIMS

1. A connection element for welded and glued interconnection of two sheet metal portions at an overlapping connection region thereof, the element comprising an electrically conductive sheet or strip which comprises a metal grid coated with a fusion-adhesive substance permitting transmission of electrical welding current to the grid and which is thermally connectible and sealable to the sheet metal portions at said region.

2. An element as claimed in claim 1, wherein the substance is meltable by electrical current of periodically controlled intensity.

3. An element as claimed in either claim 1 or claim 2, wherein the substance can be welded through by electrical current of periodically controlled intensity.

4. A connection element substantially as hereinbefore described with reference to the accompanying drawings.

5. An assembly comprising two sheet metal portions interconnected by a connection element as claimed in any one of the preceding claims.

6. A method of interconnecting two sheet metal portions, comprising the steps of placing the portions in overlapping relationship in an intended interconnection region thereof with a connection element as claimed in any one of the preceding claims disposed in said region and between the portions, and thermally connecting the portions

together by way of the element.

7. A method as claimed in claim 6, wherein the step of thermally connecting comprises applying heat to resistance weld the portions and the grid of the element together and to cause the fusion-adhesive substance to bond to the portions.

8. A method as claimed in claim 7, wherein heat to resistance weld and heat to cause the substance to bond are applied at different times.

9. A mehtod as claimed in claim 7, wherein the heat is applied with a temperature differential along the element.

10. A method as claimed in claim 6 and substantially as hereinbefore described with reference to the accompanying drawings.